

## Frequently Asked Questions about the Density Profiles

1. **How many temperature profiles are to be run in a day?** Two temperature profiles per 400-ton lot (or 400-tonne lot if metric).
2. **Is there a form to record the temperature profile results?** Yes, it is included in this e-mail. If a density profile is run, record the temperature differential on both this sheet and the Nuclear Density Profile Form.
3. **What size of jobs should this density profile procedure be done on?** All jobs greater than 2500 tons (any job that has quality assurance testing done).
4. **How many density profiles are supposed to be run in a day?** Two density profiles are to be run through an area that has a temperature differential of 25°F or greater per day. One density profile should be run through an area that has a temperature differential less than 25°F.
5. **What if there are no temperature profiles that are 25°F or greater during a day?** Only one density profile is needed in a uniform area ( $\Delta T < 25^\circ\text{F}$ ).
6. **What if the temperature differential profiles are always or almost always greater than 25°F?** Record the temperature differentials for each profile, but only two density profiles per day are needed in areas with  $\Delta T \geq 25^\circ\text{F}$  (can take more than two density profiles per day).
7. **How long does a temperature profile take?** A temperature profile should take approximately 5 minutes or so. It depends on how fast the paver is moving, but you will need to follow the paver for one truck load of hot-mix and then mark the location and offset of the temperature differential, if it exists.
8. **How long does a density profile take?** A density profile takes approximately half an hour. There is a minimum of 22 one-minute readings.
9. **How does the density operator know where to take the readings?** Whoever runs the temperature profile (contractor or DOT personnel) needs to mark the starting location and offset of the cool spot by going back through the longitudinal or transverse profile and seeing where the temperature drops. See Figure 1 for a visual representation of the offset and location for a longitudinal scan Figure 2 for a transverse scan.
10. **How many extra people are needed to do these density and temperature profiles?** No extra people should be needed to perform this work. One of the contractor or DOT personnel near the paver should be able to take 10 minutes per 400-ton lot to perform the temperature profiles. The nuclear gauge operator should be able to get the density profiles while waiting to perform or in between the quality assurance tests.
11. **What if we haven't established the roller pattern yet?** The first day of paving should be reserved for establishing the roller pattern (or however long it takes on a particular job). Temperature and density profiles do not need to be performed during this time.
12. **Why are we using the temperature guns and not the infrared camera?** The WSDOT can not afford an infrared camera for each project and not even each region, so the Materials Laboratory attempted to find something that was relatively inexpensive that would determine the temperature differential and

location. The temperature guns were found to work well during last construction season.

**13. When will we see streaks and when will we see the spots or chevrons?**

Depending on the type of equipment being used, you may see one or the other, or possibly both on a job. Spots are typically found in the wheelpaths but are sometimes known to occur in the middle of the paved lane. Streaks are typically found down either side of the middle of the lane or down the middle of the lane. If they are down both sides of the middle of the lane, they are typically 3 to 4 feet apart. The streaks are anywhere from 3 to 6 inches wide each.

- a. Typically, if end dumps are being used to dump directly into the paver, you will see spots or chevrons in the wheelpaths of the paved lane or down the middle of the lane. These spots may be distinct from each other and just in the wheelpath (or middle of the lane) or may cover the entire width of the paved lane. Typically, they will be in the wheelpaths.
- b. If a remixing device is used, locations of temperature differential have been noted in the wheelpaths, down the middle of the lane and may be distinct from one another or cover the entire width of the paved lane, as spots or streaks.
- c. If a windrow device is being used, you may see spots or streaks.
- d. These are all typical conditions, but are not necessarily exclusive to these types of equipment or guaranteed to occur because a specific type of equipment is being used. (Paver screeds can also cause streaks.)
- e. Longitudinal and transverse profiles need to be performed for all types of equipment.
- f. Also depending on the type of equipment and how it is being used, these spots may occur every truckload or may appear randomly. The streaks may be continuous or may randomly begin and end.

**14. If we have questions or concerns about this test method, whom should we contact?** Contact Kim Willoughby at [willouk@wsdot.wa.gov](mailto:willouk@wsdot.wa.gov), office phone number is (360) 709-5474, and cell phone is (360) 791-6038. The cell phone is probably the best chance. You can leave a message and Kim will get back to you as soon as possible.

**15. When do we send the data in to the Materials Laboratory?** The data can be sent to the Materials Lab via mail (MS 47365) or fax ((360) 709-5588) after the project is finished, care of Kim Willoughby.

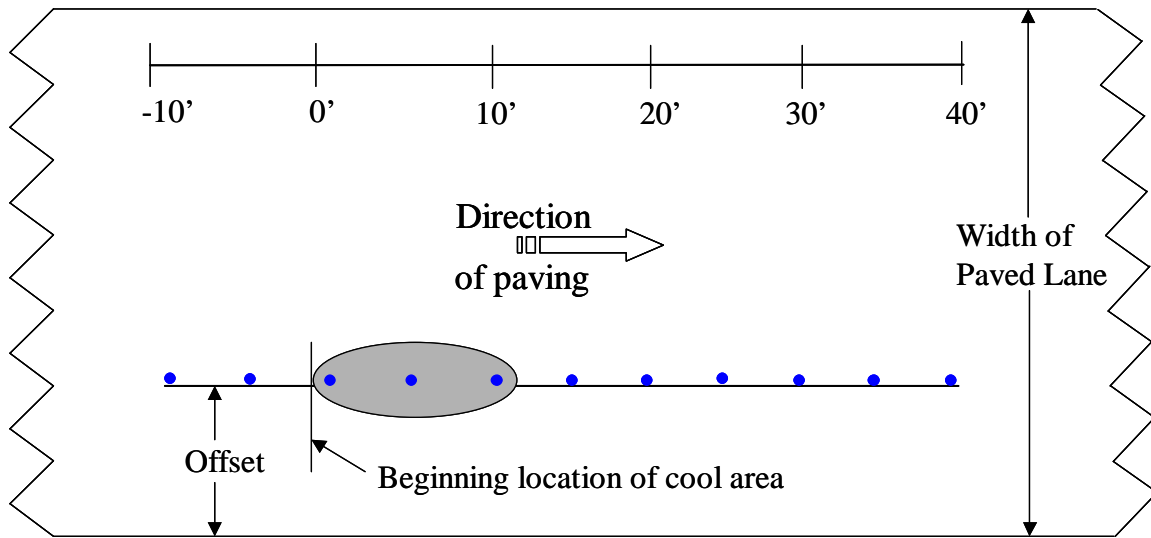


Figure 1. Offset and location of temperature differential for longitudinal scan.

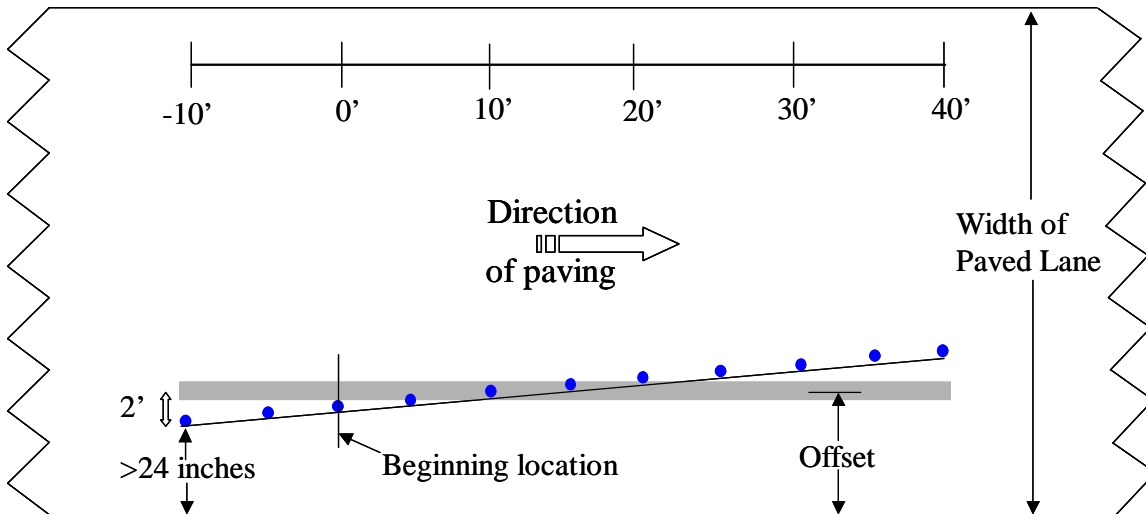


Figure 2. Offset and location of temperature differential for transverse scan.